

Appl. No. 09/903,058
Amdt. Dated March 8, 2004
Reply to Office Action of October 7, 2003

Attorney Docket No. 89224.0002

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Previously Amended) An apparatus for repairing a pipe having a damaged section, the apparatus comprising:

an elongated cylindrical barrel having an open lower end, a closed upper end and a first bore therebetween, the closed upper end including a second bore;

a plunger assembly including a plunger slidably received in the first bore, the plunger assembly further including an elongated tube having a plurality of orifices in fluid communication with the interior of the tube at a lower end thereof, the lower end of the tube being connected to the plunger, the tube being slidably received in the second bore;

a coiled patch having spring-like properties, the patch being loaded into the first bore via the open lower end of the barrel and being disposed proximate to the plunger; and

wherein pressurized hydraulic fluid may be applied to an upper end of the elongated tube, the fluid exiting the orifices in the lower end, causing the barrel to move upwardly with respect to the plunger, thereby ejecting the patch from the barrel, wherein the patch uncoils against the wall of the pipe sealing the damaged portion thereof.

2. (Original) The apparatus for repairing a pipe of claim 1, wherein the elongated tube and plunger barrel include holes, wherein a shear pin may be inserted into the holes thereby holding the tube and barrel in position to prevent unintentional deployment of the patch, the shear pin being sized to shear upon the application of pressurized hydraulic fluid to the tube.

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3. (Previously Amended) The apparatus for repairing a pipe of claim 1, wherein the hydraulic fluid is selected from the group consisting of water, compressed air, inert gas, and solid propellant produced gas.

4. (Original) The apparatus for repairing a pipe of claim 1, wherein the upper end of the elongated tube is adapted to receive a hydraulic fitting.

5. (Original) The apparatus for repairing a pipe of claim 1, wherein the patch is formed from spring-steel sheet stock and includes an inside edge and an outside edge, wherein the inside edge includes a plurality of spaced slots for engagement with a plurality of clips of like size and spacing formed on a rolling tool, wherein the patch is coiled via the rolling tool.

6. (Original) The apparatus for repairing a pipe of claim 5, wherein the spaced slots and clips are D-shaped in configuration.

7. (Previously Amended) The apparatus for repairing a pipe of claim 5, wherein the outside edge of the metal patch includes a plurality of holes of predetermined size and spacing, wherein the holes increase the ability of the patch to adhere to an inner wall of the damaged pipe.

8. (Previously Amended) The apparatus for repairing a pipe of claim 1, wherein the patch is formed of spring-steel sheet stock having a thickness within the range of about .004 to about .030 inches.

9. (Previously Amended) The apparatus for repairing a pipe of claim 1, wherein the patch is formed of Type 301 full hard stainless steel sheet stock having a thickness within the range of about .004 to about .030 inches.

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10. (Previously Amended) An apparatus for repairing a pipe having a damaged section, the apparatus comprising:

an elongated plunger barrel having an open lower end, a closed upper end and a first bore therebetween, the upper end being closed by an attached top plate, the top plate including a second bore;

a plunger assembly, the plunger assembly including a plunger slidably received in the first bore of the barrel and having a top surface, the plunger assembly further including an elongated pull-tube having a plurality of orifices at a lower end thereof, the orifices being in fluid communication with the interior of the pull-tube, the pull-tube being connected to the top surface of the plunger and being slidably received in the second bore of the top plate of the barrel, the pull-tube being spaced within the barrel in such a manner that an enclosed volume is defined between the top surface of the plunger and the top plate of the barrel;

a coiled patch having spring-like properties, the patch being loaded into the open lower end of the barrel and being disposed proximate to the plunger; and

wherein pressurized hydraulic fluid may be applied to an upper end of the elongated pull-tube, the fluid exiting the orifices in the lower end thereof, thereby filling the defined volume and causing the barrel to move upwardly with respect to the pull-tube and plunger thereby ejecting the patch from the barrel, wherein the patch uncoils against the wall of the pipe sealing the damaged portion thereof.

11. (Original) The apparatus for repairing a pipe of claim 10, wherein the pull-tube and plunger barrel include holes, wherein a shear pin may be inserted into the holes thereby holding the pull-tube and barrel in position to prevent unintentional deployment of the patch, the shear pin being sized to shear upon the application of hydraulic pressure to the pull-tube.

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12. (Previously Amended) The apparatus for repairing a pipe of claim 10, wherein the hydraulic fluid is selected from the group consisting of water, compressed air, inert gas, and solid propellant produced gas.

13. (Original) The apparatus for repairing a pipe of claim 10, wherein the upper end of the pull-tube is adapted to receive a hydraulic fitting.

14. (Previously Amended) The apparatus for repairing a pipe of claim 10, wherein the patch is formed of spring-steel sheet stock having a thickness within the range of about .004 to about .030 inches.

15. (Previously Amended) The apparatus for repairing a pipe of claim 10, wherein the patch is formed of Type 301 full hard stainless steel sheet stock having a thickness within the range of about .004 to about .030 inches.

16. (Previously Amended) The apparatus for repairing a tube of claim 10, wherein the patch is formed from metal sheet stock and includes an inside edge and an outside edge, wherein the inside edge includes a plurality of spaced slots for engagement with a plurality of clips of like size and spacing formed on a rolling tool, wherein the patch is coiled via the rolling tool.

17. (Original) The apparatus for repairing a tube of claim 16, wherein the spaced slots and clips are D-shaped in configuration.

18. (Previously Amended) The apparatus for repairing a tube of claim 16, wherein the outside edge of the metal patch includes a plurality of holes of predetermined size and spacing, wherein the holes increase the ability of the patch to adhere to an inner wall of the damaged pipe.

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19. (Previously Amended) A method for repairing an oil wellbore casing having a damaged section, the method comprising the steps of:

supplying a patch delivery tool, the delivery tool comprising a hydraulically activated plunger slidably received in a plunger barrel, the barrel having sufficient depth to receive a patch, wherein the patch is positioned proximate to and below the plunger;

supplying a flat metal patch of predetermined shape and thickness, the patch including a plurality of spaced slots along one side for engagement with a rolling tool;

supplying a rolling tool with a plurality of clips engageable with the slots of the patch;

engaging the clips of the rolling tool with the slots of the patch and rolling the flat patch into a coiled cylindrical configuration;

loading the patch into the barrel of the delivery tool;

deploying the loaded delivery tool over a wellbore to be patched;

connecting the delivery tool to a lowering cable and a source of pressurized hydraulic fluid;

lowering the delivery tool in the wellbore to a location proximate the damaged section of the well casing; and

deploying the patch from the delivery tool by supplying pressurized hydraulic fluid to the hydraulically activated plunger, wherein the patch uncoils upon deployment and seals the damaged section of the well casing.

20-22. (Cancelled)